

## SUBTIDAL BENTHIC MARINE ALGAE OF THE TODOS OS SANTOS BAY, BAHIA STATE, BRAZIL

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### ABSTRACT

The Todos os Santos bay is a Brazilian coastal marine area that was appointed as top priority for biological conservation. However, there are still too few studies about the local composition of marine communities. The aim of the present investigation was to survey the diversity of marine algae in the sub-tidal zone around the reefs of the Todos os Santos bay. Samples from seven different sites in the bay were obtained by scuba diving through qualitative and quantitative methods, being the collections repeated in rainy and dry seasons. One-hundred and forty-two taxa were found: 31 Chlorophyta, 27 Ochrophyta, 83 Rhodophyta, and one Macrophyte. Higher diversity and evenness indices were found during the dry season. *Sargassum* spp., *Dictyopteris delicatula*, and *Halimeda opuntia* were the most abundant macroalgae in the bay. Greatest number of species and most abundant samples were obtained in the oceanic region of the bay, while fewer species and less abundant samples were obtained in areas that are more exposed to the effects of human disturbance. The composition of the flora and abundance of macroalgae in each area of Todos os Santos bay seem to be determined by the quality of local seawater (i.e. degree of eutrophication).

**Keywords:** Macroalgae, tropical bay, reef formation, eutrophication.

### RESUMO

**ALGAS MARINHAS BENTÔNICAS DO INFRALITORAL DA BAÍA DE TODOS OS SANTOS (BAHIA, BRASIL).** Apesar da Baía de Todos os Santos (BTS) ser considerada uma área de extrema importância biológica para a conservação da zona costeira brasileira, poucos estudos sobre as comunidades marinhas de seus ecossistemas foram realizados até o momento. Neste sentido, o objetivo deste trabalho é o de caracterizar a diversidade de algas marinhas do sub-litoral das formações recifais da BTS. Dois tipos de amostragem foram realizados: uma qualitativa e outra quali-quantitativa em sete locais de coleta. Foram identificados 142 táxons, sendo 31 Chlorophyta, 27 Ochrophyta e 83 Rhodophyta, e uma fanerógama marinha. Foi observada uma tendência a maiores valores de diversidade e equitabilidade na época seca. *Sargassum* spp., *Dictyopteris delicatula* e *Halimeda opuntia* foram os táxons que mais contribuíram para a abundância de macroalgas na BTS. O maior número de táxons e os maiores valores de biomassa foram encontrados em local voltado para o mar aberto, enquanto que, os menores valores foram encontrados em locais com algum tipo de distúrbio antrópico. A distribuição da flora e da abundância de macroalgas da BTS é determinada pela condição de eutrofização de cada um dos locais estudados.

**Palavras-chave:** Macroalga, baía tropical, formação recifal, eutrofização.

### INTRODUCTION

In order to successfully implement environmental management and conservation programs in marine

ecosystems, it is first necessary to determine the structure and dynamics of the communities and populations of these ecosystems. Nonetheless, the degradation rate of natural systems is still usually

faster than the counteracting effects of conservation programs. Partially closed marine systems, such as bays surrounded by cities, figure among the most sensitive coastal environments on the planet.

Todos os Santos Bay (13°S, 38°W) is one of the largest Brazilian bays, with an area of about 1,000 km<sup>2</sup> (Silva *et al.* 1996), located in one of the most important urban centres of Northeastern Brazil. This bay is directly affected the large metropolis of Salvador (2.8 million inhabitants), with its industrial wastes of chemical plants and an oil refinery, and by the activities of a harbour located over its North and Northeast area.

The Todos os Santos Bay – we will refer to it as TSB henceforth – is also important to the local tourism, and shell-fishing is widely spread in its waters. There are many different habitats, such as estuaries, inner bays, mangroves, coral reefs, and rocky coasts within this bay (Silva *et al.* 1996).

The coral reefs and rocky shores of tropical regions are considered the most diverse marine environments on the planet (Munõz & Pereira 1998, Villaça 2002). Brazil is the only country of the South Atlantic Ocean with coral reefs (Castro 1999). The Brazilian reefs of Bahia State are considered the most diverse of the country, and house many endemic species of corals and others organisms (Leão 1996, Castro 1999, Villaça 2002). In Bahia alone Leão (1996) observed as many as five different kinds of coral reefs distributed in five sectors along the coast.

In 2002, the TSB was appointed by the Brazilian Environmental Ministry as an area of outstanding biological importance and of top priority for conservation, chiefly because of its coral reefs (Ministério do Meio Ambiente 2002). The great importance of coral reefs is as much due to their biological diversity as to their elevated biological productivity. The rapid population growth and industrial development around the TSB are negatively affecting the quality of its waters in many ways (Tavares *et al.* 1977, Souza *et al.* 1978, Wallner-Kersanach 1994, Silva *et al.* 1996, Amado-Filho *et al.* 2001, Macedo *et al.* 2001). Along some coastal areas of the TSB the unrestrained urban growth becomes evident, especially in the city periferies, what is potentially dangerous to coral reefs, according with Leão (1996).

Apart from some studies about the marine algae of some areas of the TSB (Joly *et al.* 1965a,b, Araújo

1984, Santos 1992, Guimarães & Oliveira 1996, Moura *et al.* 1999, Nunes 1999, Nunes & Paula 2002, Barros-Barreto *et al.* 2004, Alves & Moura 2005, Nunes, 2005a,b), no comprehensive investigation was done on the benthic flora of the TSB. Thus, the aim of the present study was to contribute to the body of knowledge about the marine biota of sub-tidal reefs of TSB and to analyse the degree of similarity among its different areas and during the different seasons.

## MATERIAL AND METHODS

### STUDY AREA

The TSB is located at the North part of the coast of Bahia state, as shown in Figure 1. There is an ample diversity of habitats in TSB, reflecting in a great diversity of organisms (Silva *et al.* 1996). The local coral reefs were described by Leão (1996) as shallow fringe reefs, more or less continuous, occurring in depths ranging from about water level to up to no more than 10m deep, in the fore reef zone.

The sediment texture of the sea floor of the TSB varies from clay to very thick sand. The climate in this region is tropical humid, and presents two distinct periods: a dry one and a rainy one. The rainy period takes place in April/June, with the precipitation reaching about 930mm, which is almost 45% of the mean total annual rain precipitation of 2,100mm/year. The average value between the highest and lowest temperatures of the year is always higher than 18°C within the TSB region. The lowest temperatures (23.6°C) are usually recorded in July, while the highest temperatures come in March (26.7°C) (Macedo *et al.* 2001).

Water circulation within TSB bay is chiefly driven by tides, which are semi-diurnal with a maximum range of 2.7m (Lessa *et al.* 2001). In its main part, salinity in the bay ranges 33.0-36.7ppm, and the temperature of the water varies 24-30°C – a typical variation of open shallow marine areas (Wolgemuth *et al.* 1981). The tidal currents are generally weak, being strongest closer to the mid-tide. Yet, around the entrance of the bay and about Frades Island, a kind of channel is formed between the island and the land, and the currents of these areas can reach 80cm/s (Lessa *et al.* 2001).

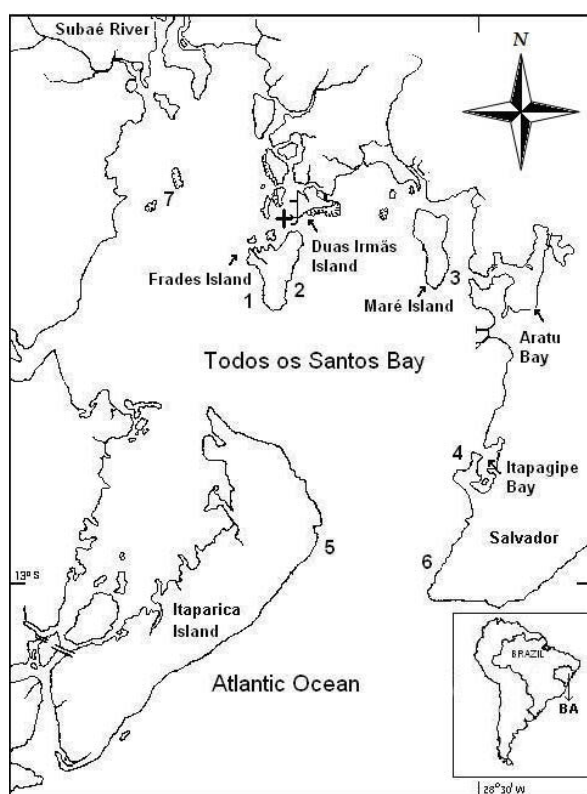


Figure 1. Map of Todos os Santos bay and sampling sites. – (1) Tapera, (2) Paramana, (3) Botelho, (4) Humaitá, (5) Penha, (6) Farol da Barra, (7) Saubara. Detail on the lower right: Location of Bahia State in Brazil.

## SAMPLING

A total of seven sites for sampling in the TSB were selected (indicated by numbers in Figure 1) with the objective of representing the overall local phytobenthic diversity. Two of them, namely Tapera ( $12^{\circ}48'20''\text{S}$  and  $38^{\circ}38'49''\text{W}$ ) and Paramana ( $12^{\circ}47'38''\text{S}$  and  $38^{\circ}37'26''\text{W}$ ), are located at Frades Island, which is an ecological reserve located at the centre of TSB. Another site, Botelho, is located to the east of Maré Island ( $12^{\circ}47'26''\text{S}$ ,  $38^{\circ}30'47''\text{W}$ ) and in front of Cotagipe channel, which connects the TSB with Aratu Bay; it is worth noting that it is located near to the Aratu Industrial Complex. Humaitá ( $12^{\circ}55'08''\text{S}$ ,  $38^{\circ}30'30''\text{W}$ ) is near to Itapagipe Bay and to the periphery of Salvador, being in one of the most impacted areas in TSB (Wallner-Hersanach, 1994). Another sampling site, Penha ( $13^{\circ}59'13''\text{S}$ ,  $38^{\circ}36'36''\text{W}$ ), located to the east of Itaparica Island, and is of difficult access for it faces open ocean and thus presents stronger waves. Farol da Barra ( $13^{\circ}00'30''\text{S}$ ,  $38^{\circ}32'01''\text{W}$ ) is close to one of the most important touristic sites of Salvador. Finally, Saubara

( $12^{\circ}44'29''\text{S}$ ,  $38^{\circ}43'06''\text{W}$ ) is over a reef located near to the Subaé river, to the northwestern side of TSB.

Sample collection was carried out by scuba-diving, with two different kinds of approach: qualitative and quantitative. Quantitative sampling was done in May and December of 2000, with the objective of including, respectively, a rainy and a dry season. Qualitative sampling was done in the same periods and also in September 2000 (a rainy period) and April 2001 (a dry period) (consult INMET web page). The sampling was done through 'destructive' methods. For quali-quantitative sampling, seven square sections of  $20 \times 20\text{cm}^2$  were randomly distributed along a 20m-long horizontal imaginary line about 1–3m deep. For qualitative sampling, a 100m-long sampling line was traced and algae were therein collected at random. Sampling was always done by the same divers, and they tried to obtain as diverse species as possible. Crustose calcareous algae were not sampled.

After collection, all sampled materials were kept inside plastic bags and fixed with formalin 4%. In the laboratory, qualitatively-sampled materials were separated for later determination of habit, phenology and species, while the quantitatively-sampled materials were identified in species and counted. Species identification was done with the aid of an optical microscope, a stereomicroscope, and general and using specialized bibliography (e.g. Joly *et al.* 1969b, Nunes 1998a, 1999, Nunes *et al.* 1999, Nunes & Paula 2000, 2002). Nomenclature used followed Wynne (2005).

Algae population of each square section was quantified based on dry weight: after identification, every population from each section was sorted under a stereomicroscope and dried at  $60^{\circ}\text{C}$  for 48h. The populations were then weighed with an analytical scale. Samples weighting less than 0.001g were assumed to weight 0.0001g. Means are always presented with standard error (S.E.).

## DATA ANALYSES

Data from qualitative collections was used to compare the different sites and seasons in terms of number of species and morphological clusters present. Data from quantitative collections was used to evaluate differences between seasons and sampled sites in terms of biomass. In latter analyses, means were compared

through Cochran's variance analysis by two-way ANOVA, using the STATISTICA software v. 5.0. The following indices were determined and compared for each area and season: Shannon-Wiener Diversity index ( $H'$ ), Pielou Evenness index ( $J'$ ) (see Brewer & Zar, 1997), and percentage importance ( $P_i\%$ ) of each species. The latter is a measure of how much of the biomass value found for each site that species represents. Moreover, a dendrogram was built based on an UPGMA cluster analysis of Bray-Curtis (1957) coefficients, and also a SIMPER (Similarity Percentage Report) analysis based on the Bray-Curtis similarity index with PRIMER software v. 5.0. The SIMPER analyses yielded a list of the species which contributed the most for the clusters detected in the dendrogram, in order of importance, until they reach, together, 90% of similarity and dissimilarity between the clusters.

## RESULTS

### QUALITATIVE DATA

A total of 142 taxa were identified: 31 Chlorophyta, 27 Ochrophyta, 83 Rhodophyta, and one seagrass *H. decipiens* Ostensfeld (Table I), totalling 19 orders, 37 families, 75 genera, 132 species, and 11 varieties and forms.

Amongst the Chlorophyta, the order Bryopsidales was the most representative one with 21 taxa, while the order Dictyotales was the most representative of the Ochrophyta. Among Rhodophyta, the order Ceramiales presented the greatest number of taxa (37). *Ceramium* Roth (12), *Caulerpa* J. V. Lamour (10) and *Dictyota* J. V. Lamour (7) were the most representative genera.

The greatest number of taxa (92) was found in Penha, followed by Paramana (60). The lowest numbers of taxa were found in Farol da Barra and Humaitá – 23 and 24, respectively (Figure 2).

The number of species tended to increase during the dry season (Figure 2) in some of the sampled sites.

The greatest difference in number of species between seasons was found between Penha and Humaitá. Tapera and Botelho presented more species during the rainy seasons, while no significant difference in number of species found between seasons was perceived in Paramana, Saubara and Farol da

Barra (Figure 2), although the species composition of these areas was quite different (Table I).

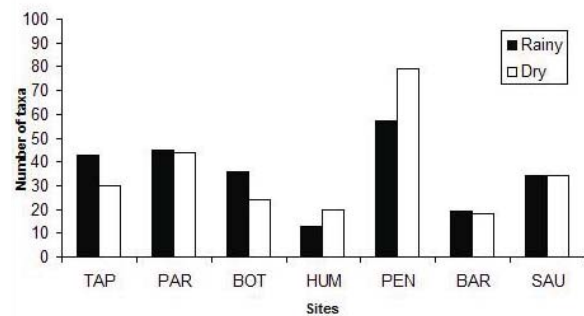


Figure 2. Number of taxa found in each sampled area during the rainy and dry seasons; TAP-Tapera, PAR- Paramana, BOT- Botelho, HUM-Humaitá, PEN- Penha, BAR- Farol da Barra, SAU-Saubara.

Penha presented the highest amount of exclusive taxa (14) while Humaitá had only one exclusive taxon (Table I). The only species that were found in all the sampled sites were *D. delicatula* and *H. spinella*.

Most species found in the TSB are widely spread over the Brazilian coast: 44% occur in the Northeastern, Southeastern and South regions and 39% can be found in the Southeastern and South regions of Brazil. Among these, it should be stressed that *B. pusilla*, *B. pennata*, *B. plumosa*, *C. vagabunda*, *U. fasciata*, *D. delicatula*, *D. cervicornis* f. *cervicornis*, *P. gymnospora*, *C. clavulatum*, *G. crinale*, *J. adhaerens* and *P. subtilissima* occur in practically all the coast of Brazil from Maranhão to Rio Grande do Sul. Only 9% of the species found are restricted to the Northeastern region of Brazil.

Thirty-four percent of the 142 identified taxa were observed to be fertile during the study periods (Table I). Sporophytic taxa figured 75% of the fertile taxa. No fertile chlorophytes were found. Male plants were less frequent (found in 8 taxa) than females (found in 19 taxa). Tapera and Penha presented the highest percentage of fertile taxa (both 30%), although Penha had twice the number of taxa found in Tapera. Botelho had the lowest number of fertile taxa (5%). An increase in the number of fertile taxa was observed during the rainy seasons in Tapera, Paramana and Farol da Barra. The number of fertile taxa did not vary in Saubara between the different seasons. In Botelho, two fertile taxa were observed, only in the dry season.

Regarding the epiphyte-host relationship, *D. delicatula* was an epiphyte of most taxa (30),

Table 1. List of the taxa found in the 7 sampled sites of the TSB during rainy (R) and dry (D) seasons, with phenology: (+) Present; (-) Absent; (F) Female; (M) Male; (T) Tetrasporic; (H) Hermaphrodite; (P) Plurilocular.

TAXA	SITES													
	TAPERA		PARAMANA		BOTELHO		HUMAITÁ		PENHA		F. BARRA		SAUBARA	
	R	D	R	D	R	D	R	D	R	D	R	D	R	D
<b>Chlorophyta (31)</b>														
<i>Anadyomene stellata</i>	-	+	-	-	-	-	-	-	+	+	-	-	-	-
<i>Boodleopsis pusilla</i>	+	-	-	-	-	-	-	-	+	+	-	-	-	-
<i>Bryopsis pennata</i>	-	+	+	+	+	-	-	+	-	-	+	+	-	-
<i>Bryopsis plumosa</i>	-	+	-	-	+	-	+	+	-	-	-	-	-	-
<i>Caulerpa brachypus</i>	-	-	+	+	-	+	-	-	-	-	-	-	-	+
<i>Caulerpa cupressoides</i>	-	-	+	+	-	-	-	-	-	+	-	-	-	-
<i>Caulerpa kempfii</i>	-	-	-	-	-	-	-	-	+	+	-	-	-	-
<i>Caulerpa mexicana</i>	+	-	+	+	-	-	-	-	+	+	-	-	+	+
<i>Caulerpa racemosa</i>	-	-	-	-	-	-	-	-	+	+	-	-	+	-
<i>Caulerpa racemosa</i> var. <i>peltata</i>	-	-	-	-	+	-	-	-	-	-	-	-	-	-
<i>Caulerpa racemosa</i> var. <i>occidentalis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	+
<i>Caulerpa serrulata</i>	-	-	-	-	-	-	-	-	-	+	+	-	-	-
<i>Caulerpa verticillata</i>	-	-	-	-	-	-	-	-	-	+	-	-	+	-
<i>Caulerpa webbiana</i>	-	-	-	-	-	-	-	-	+	+	-	-	-	-
<i>Caulerpella ambigua</i>	-	-	+	-	-	-	-	-	+	+	+	+	+	+
<i>Cladophora vagabunda</i>	+	-	+	-	-	-	-	-	-	-	-	-	-	-
<i>Cladophora</i> sp	-	-	-	-	+	+	+	+	-	-	-	+	+	-
<i>Codium intertextum</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Derbesia</i> sp	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Dictyosphaeria versluisii</i>	+	-	+	+	-	-	-	-	+	-	-	-	-	-
<i>Entocladia viridis</i>	+	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Halimeda discoidea</i>	-	-	-	-	-	-	-	-	+	+	-	-	-	-
<i>Halimeda opuntia</i>	+	+	+	+	-	+	-	-	+	+	-	+	-	-
<i>Penicillus capitatus</i>	-	-	-	-	-	-	-	-	+	+	-	-	-	-
<i>Phyllocladon</i> sp	-	-	-	-	-	+	-	-	-	-	-	-	-	-
<i>Udotea cyathiformis</i> var. <i>cyathiformis</i> f. <i>sublittoralis</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Udotea flabellum</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	+
<i>Ulva fasciata</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	-
<i>Ulva flexuosa</i>	-	-	-	-	+	-	-	+	-	-	-	-	-	-
<i>Ulva lactuca</i>	-	-	-	-	-	-	+	+	+	-	-	-	-	-
<i>Ventricaria ventricosa</i>	+	+	-	-	-	-	-	-	+	+	-	-	-	-
<b>SUB-TOTAL</b>	<b>7</b>	<b>5</b>	<b>8</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>5</b>	<b>13</b>	<b>16</b>	<b>3</b>	<b>5</b>	<b>6</b>	<b>5</b>
<b>Phaeophyta (27)</b>														
<i>Dictyopteris delicatula</i>	T	+	+	+	+	+	+	+	T	T	T	+	T	+
<i>Dictyopteris jamaicensis</i>	-	-	-	-	-	-	-	-	-	-	-	-	T	T
<i>Dictyopteris justii</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Dictyopteris plagiogramma</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Dictyota bartayresiana</i>	-	-	-	+	-	-	-	+	+	T	-	-	-	-
<i>Dictyota cervicornis</i> f. <i>cervicornis</i>	T	+	+	+	+	+	+	+	-	+	-	-	+	+
<i>Dictyota cervicornis</i> f. <i>pseudohamata</i>	T, F	+	+	+	+	+	-	-	-	+	-	-	+	+
<i>Dictyota ciliolata</i>	T	-	T	-	-	-	-	-	-	+	-	-	-	+
<i>Dictyota crenulata</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Dictyota pulchella</i>	-	-	+	-	-	+	-	-	-	+	-	-	-	+
<i>Dictyota mertensii</i>	T	+	-	-	+	+	-	M	+	+	-	-	-	-
<i>Feldmania irregularis</i>	-	-	P	-	-	-	-	-	-	-	-	-	-	-
<i>Hincksia mitchelliae</i>	+	+	P	+	+	+	-	-	-	-	-	-	-	-
<i>Lobophora variegata</i>	+	+	-	-	+	+	-	-	+	+	-	-	+	+
<i>Padina antillarum</i>	-	-	-	-	+	-	-	-	-	-	-	-	+	T
<i>Padina boergesenii</i>	-	-	-	+	-	-	-	-	-	-	-	-	-	-
<i>Padina gymnospora</i>	-	-	-	+	+	T	-	-	-	-	-	-	T	T
<i>Padina sanctae-crucis</i>	-	+	-	-	-	-	-	-	-	T	-	-	-	-
<i>Rosenvingea sanctae-crucis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-	-
<i>Sargassum cymosum</i>	-	-	-	-	-	-	-	-	-	-	-	-	F, M	F, M
<i>Sargassum filipendula</i> var. <i>filipendula</i>	+	+	F, M	+	+	-	-	-	-	-	-	-	-	-
<i>Sargassum filipendula</i> var. <i>montagnei</i>	+	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Sargassum furcatum</i>	-	+	+	+	+	-	-	-	-	-	-	-	-	-
<i>Sargassum vulgare</i> var. <i>vulgare</i>	+	H	H	+	+	+	-	-	-	H	-	-	-	-
<i>Spatoglossum schroederi</i>	-	+	-	-	+	+	-	+	+	-	+	T	-	-
<i>Sphacelaria tribuloides</i>	-	+	+	+	+	-	-	-	-	-	-	-	-	-
<i>Styopodium zonale</i>	-	-	-	-	-	+	-	-	-	-	-	-	-	-
<b>SUB-TOTAL</b>	<b>10</b>	<b>12</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>5</b>	<b>5</b>	<b>13</b>	<b>2</b>	<b>2</b>	<b>8</b>	<b>10</b>

Table I (cont.)

TAXA	SITES													
	TAPERA		PARAMANA		BOTELHO		HUMAITÁ		PENHA		F. BARRA		SAUBARA	
	R	D	R	D	R	D	R	D	R	D	R	D	R	D
<b>Rhodophyta (83)</b>														
<i>Acanthophora spicifera</i>	-	-	-	-	+	-	-	+	-	-	-	-	+	+
<i>Acrochaetium densum</i>	-	-	+	-	-	-	-	-	-	-	-	-	-	-
<i>Acrochaetium microscopium</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Acrothamnion butleriae</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Aglaothamnion felliponei</i>	+	-	+	+	+	-	-	-	-	+	-	-	-	-
<i>Amansia multifida</i>	-	-	-	-	-	-	-	-	+	T	+	+	-	-
<i>Amphiroa anastomosans</i>	+	+	+	+	-	-	-	-	-	+	+	-	-	-
<i>Amphiroa beauvoisii</i>	+	+	T	+	-	-	-	-	T	+	-	-	-	-
<i>Amphiroa fragilissima</i>	T	T	T	+	-	-	+	-	T	+	-	-	+	+
<i>Amphiroa rigida</i>	-	-	T	+	-	-	-	-	+	-	+	+	-	-
<i>Anotrichium tenue</i>	+	-	+	-	+	-	+	-	+	+	-	-	-	-
<i>Asparagopsis taxiformis</i>	-	-	-	+	+	-	-	-	+	+	-	-	-	-
<i>Botryocladia occidentalis</i>	-	-	-	-	-	-	-	-	+	F	-	-	-	-
<i>Bryothamnion seaforthii</i>	-	-	-	-	-	-	-	-	+	F	-	-	-	-
<i>Bryothamnion triquetrum</i>	-	-	-	-	-	-	-	-	T	-	-	-	-	-
<i>Callithamnion corymbosum</i>	-	-	+	+	+	-	-	-	+	-	-	-	-	-
<i>Centroceras clavulatum</i>	-	-	-	-	-	+	-	-	-	-	-	-	-	-
<i>Ceramium brevizonatum</i> var. <i>caraibicum</i>	-	-	+	-	-	-	-	-	-	-	-	-	-	-
<i>Ceramium</i> cf. <i>camouii</i>	-	-	-	-	-	-	-	+	-	-	-	-	-	-
<i>Ceramium cimbricum</i> f. <i>flaccida</i>	-	-	-	-	-	+	-	-	-	T	-	-	-	T, M
<i>Ceramium clarionense</i>	-	-	-	+	-	-	-	-	+	+	-	-	-	-
<i>Ceramium</i> cf. <i>codii</i>	-	-	-	-	-	-	-	+	-	+	-	-	-	+
<i>Ceramium comptum</i>	-	-	-	+	-	-	+	-	+	+	-	+	-	-
<i>Ceramium dawsonii</i>	-	-	-	+	-	-	+	-	-	-	M, T	-	-	-
<i>Ceramium deslongchampsii</i>	+	-	-	-	-	-	-	-	+	-	-	-	-	-
<i>Ceramium flaccidum</i>	T, M	+	F	+	-	+	+	+	T	T	-	-	-	-
<i>Ceramium luetzelburgii</i>	-	-	+	-	-	-	-	-	+	+	-	-	-	-
<i>Ceramium</i> cf. <i>serpens</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Ceramium vagans</i>	-	-	+	+	-	-	-	-	+	-	-	-	-	-
<i>Champia parvula</i>	+	+	-	-	-	-	-	-	-	+	-	-	-	-
<i>Champia veillardii</i>	-	-	+	+	-	-	-	-	T	T	-	-	-	-
<i>Chondracanthus acicularis</i>	-	-	-	-	-	-	-	-	-	-	F	-	-	-
<i>Chondrophycus translucidus</i>	+	-	+	-	-	-	-	-	-	-	-	-	-	-
<i>Corallina officinalis</i>	+	-	+	-	-	-	-	-	+	+	-	-	-	-
<i>Crouania attenuata</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	+
<i>Cryptonemia crenulata</i>	-	-	-	-	+	-	-	-	-	T	-	-	-	+
<i>Dasya</i> sp	-	-	+	-	-	-	-	-	-	-	-	-	-	-
<i>Dichotomaria marginata</i>	-	-	-	-	+	-	-	-	+	+	-	-	-	-
<i>Dichotomaria obtusata</i>	-	-	-	+	-	-	-	-	-	-	-	-	+	+
<i>Dipterosiphonia dendritica</i>	-	-	-	-	+	-	-	-	+	+	-	-	-	-
<i>Dohrniella antillarum</i> var. <i>brasiliensis</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Erythrotrichia carnea</i>	+	-	-	-	+	-	-	-	-	+	+	-	-	-
<i>Galaxaura rugosa</i>	-	+	+	-	-	-	-	-	+	-	-	-	-	-
<i>Gelidiella acerosa</i>	+	-	T	-	-	-	-	-	T	+	-	-	T	+
<i>Gelidiella ligulata</i>	-	-	-	-	-	-	-	-	+	-	+	+	-	-
<i>Gelidiopsis planicaulis</i>	T	-	+	-	-	-	-	-	+	T	-	-	+	+
<i>Gelidiopsis variabilis</i>	+	-	-	-	+	+	-	-	-	+	+	+	-	-
<i>Gelidium crinale</i>	-	+	-	+	-	-	-	-	+	+	+	+	-	-
<i>Gelidium floridanum</i>	-	-	-	-	-	-	-	-	-	F	-	-	-	-
<i>Gelidium</i> sp	+	+	-	-	+	-	+	+	+	+	F	+	+	-
<i>Gracilaria cervicornis</i>	-	-	T, F, M	+	+	-	-	-	-	T	-	-	F	F
<i>Gracilaria comea</i>	-	-	-	-	-	-	-	-	F	-	-	-	+	-
<i>Gracilaria curtissiae</i>	-	-	-	-	-	-	-	-	F	-	-	-	-	-
<i>Gracilaria</i> sp	-	-	-	-	-	-	-	-	-	-	-	-	+	+
<i>Gracilaria</i> sp2	-	-	-	-	-	-	-	-	-	-	-	-	+	+
<i>Gracilaria</i> sp3	-	-	-	-	-	-	-	-	-	-	-	-	-	+
<i>Gracilaria</i> sp4	-	-	-	-	-	-	-	-	-	-	-	-	-	+
<i>Halptilon cubense</i>	-	-	-	-	-	-	-	-	T	+	-	-	+	-
<i>Halptilon subulatum</i>	-	-	-	-	-	-	-	-	+	+	-	-	+	-
<i>Heterosiphonia crispella</i>	-	-	-	+	+	-	-	-	-	-	-	-	-	+
<i>Herposiphonia secunda</i>	+	-	-	-	-	-	-	-	+	F	-	-	-	-

Table I (cont.)

TAXA	SITES													
	TAPERA		PARAMANA		BOTELHO		HUMAITÁ		PENHA		F. BARRA		SAUBARA	
	R	D	R	D	R	D	R	D	R	D	R	D	R	D
<i>Herposiphonia tenella</i>	+	-	+	+	+	+	-	-	+	+	+	+	-	-
<i>Hypnea musciformis</i>	+	+	-	-	+	-	+	T	T	T	-	-	+	+
<i>Hypnea spinella</i>	+	T	T	-	+	T	T	T	+	T	+	+	+	-
<i>Jania adhaerens</i>	+	+	+	+	-	-	-	-	+	+	+	+	+	+
<i>Laurencia filiformes</i>	-	+	T	+	+	+	-	T	-	-	-	-	+	-
<i>Meristotheca gelidium</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	+
<i>Neosiphonia ferulacea</i>	-	-	-	+	-	-	-	-	-	-	-	-	-	-
<i>Neosiphonia tongatensis</i>	T, F	-	-	F	-	-	-	-	-	-	-	-	-	-
<i>Ochtodes secundiramea</i>	-	-	-	-	-	-	-	-	T, M	T	T, F	T	-	-
<i>Petroglossum undulatum</i>	-	-	-	-	-	-	-	-	+	+	-	-	+	T, F
<i>Polysiphonia denudata</i>	F	-	-	+	+	+	-	+	-	-	-	-	-	-
<i>Polysiphonia scopulorum</i>	+	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Polysiphonia subtilissima</i>	T, F	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Pterocladia caerulescens</i>	+	+	-	-	-	-	+	+	+	-	-	-	-	-
<i>Shalingia subintegra</i>	-	-	+	+	-	-	-	-	-	+	+	-	-	-
<i>Solieria filiformes</i>	-	-	+	F, T	-	-	-	-	-	+	-	-	-	-
<i>Spyridia filamentosa</i>	-	-	-	-	-	-	-	-	-	+	-	-	+	-
<i>Stylonema alsidii</i>	+	-	-	+	+	-	-	-	-	-	-	-	-	-
<i>Tricleocarpa cylindrica</i>	-	-	-	+	-	-	-	-	+	+	-	-	-	-
<i>Trichogloea requienii</i>	-	-	-	-	-	-	-	-	-	T	-	-	-	-
<i>Wrangelia argus</i>	-	-	-	+	-	-	-	-	-	T	-	-	-	-
<i>Wurdemanina miniata</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	-
<b>SUB-TOTAL</b>	<b>26</b>	<b>13</b>	<b>26</b>	<b>27</b>	<b>20</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>39</b>	<b>50</b>	<b>14</b>	<b>11</b>	<b>20</b>	<b>19</b>
<b>Marine Monocotyledone (1)</b>														
<i>Halophila decipiens</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	+
<b>SUB-TOTAL</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>TOTAL = 142</b>	<b>43</b>	<b>30</b>	<b>45</b>	<b>44</b>	<b>36</b>	<b>24</b>	<b>13</b>	<b>20</b>	<b>57</b>	<b>79</b>	<b>19</b>	<b>18</b>	<b>34</b>	<b>35</b>

followed by *A. fragilissima* and *H. spinella* which were epiphyte of 24 and 22 taxa, respectively. The species with more epiphyte taxa were *S. vulgare* var. *vulgare*, *G. cervicornis*, *H. opuntia*, *D. cervicornis* var. *pseudohamata*, and *G. crinale* (14, 13, 11, 11, and 10, respectively).

QUANTITATIVE DATA

The mean dry biomass found for all square sections of the TSB was 273±48 g.m<sup>-2</sup>. Penha presented the highest mean biomass: 367±46 g.m<sup>-2</sup>. An increase in biomass was observed during the rainy seasons in all sites except Penha (compare Table II, Table III, and Figure 3).

Regarding the Pi% of each species, those of the Ochrophyta group (mainly *Sargassum* spp., *D. delicatula* and *L. variegata*) were the most abundant species in Tapera, Botelho, Saubara, and Farol da Barra. In Paramana the chlorophyte *H. opuntia* was the most abundant species, while in Humaitá the Rhodophyta *H. spinella* was the most abundant. In Penha, *B. seaforthii* (Rhodophyta) was the most abundant during the rainy season, while in the dry season the Ochrophyta was most abundant (Table IV).

The mean Diversity index (H') and Evenness index (J') of the TSB were 1.36 and 0.39, respectively. A tendency to increased values of H' and J' was observed in Paramana and Penha and also in samples from the dry seasons (Table V).

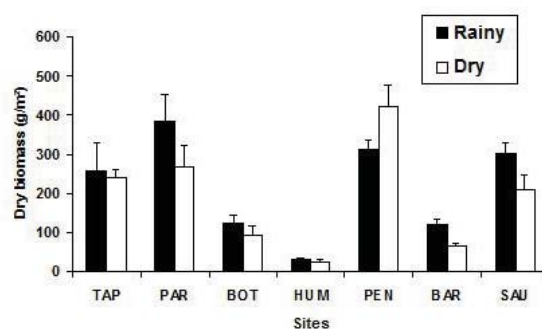


Figure 3. Mean biomass recorded for each sampled site during rainy and dry seasons. Vertical lines stand for standard error; TAP-Tapera, PAR-Paramana, BOT- Botelho, HUM- Humaitá, PEN- Penha, BAR- Farol da Barra, SAU-Saubara.

Table II. Bi-factorial ANOVA results of biomass. Independent factors considered were sampled site and season.

Source	df	MS	F	P
Sites	6	357.93	22.59	<0.0001
Seasons	1	2.66	0.17	0.68
Sites x Seasons	6	29.60	1.87	0.10
Error	84	9903.26		

Table III. Tukey test results of the comparison between the biomass values found in each sampled site (significant *p* values in bold): TAP-Tapera, PAR-Paramana, BOT- Botelho, HUM- Humaitá, PEN- Penha, BAR- Farol da Barra, SAU- Saubara.

TAP	PAR	BOT	HUM	PEN	BAR	SAU
TAP	0.345	<b>0.007</b>	<b>0.000</b>	<b>0.036</b>	<b>0.003</b>	0.978
	PAR	<b>0.000</b>	<b>0.000</b>	0.931	<b>0.000</b>	0.063
		BOT	0.337	<b>0.000</b>	0.999	0.067
			HUM	<b>0.000</b>	0.562	<b>0.000</b>
				PEN	<b>0.000</b>	<b>0.004</b>
					BAR	<b>0.027</b>
						SAU

Table IV. Mean biomass (g.m<sup>-2</sup>) and percentual of importance (Pi%) of taxa which represented more than 1% of the total mean biomass found in each sampling site and season; (S.E.) Standard Error

Taxon/ Season	g.m <sup>-2</sup>	S.E.	Pi(%)	Taxon/ Season	g.m <sup>-2</sup>	S.E.	Pi(%)
Tapera							
RAINY				DRY			
<i>L. variegata</i>	142.3	62.8	55.5	<i>L. variegata</i>	79.6	39.5	33.7
<i>S. vulgare</i>	55.6	18.1	21.7	<i>S. filipendula</i>	63.4	29.4	26.9
<i>D. delicatula</i>	25.8	2.8	10.0	<i>S. vulgare</i>	58.6	21.2	24.8
<i>S. filipendula</i>	21.6	18.3	8.4	<i>D. cervicornis</i>	8.0	2.8	3.4
<i>V. ventricosa</i>	3.5	3.5	1.4	<i>H. opuntia</i>	6.9	4.4	2.9
				<i>G. crinale</i>	6.8	4.4	2.9
				<i>D. delicatula</i>	4.9	1.5	2.0
				<i>S. furcatum</i>	4.3	4.3	1.8
				<i>S. schroederi</i>	2.4	1.4	1.0
Paramana							
RAINY				DRY			
<i>H. opuntia</i>	182.3	91.8	47.8	<i>H. opuntia</i>	99.7	40.3	36.9
<i>S. vulgare</i>	90.9	48.9	23.8	<i>C. officinalis</i>	64.5	19.8	23.9
<i>S. filipendula</i>	54.1	27.9	14.2	<i>S. furcatum</i>	31.4	11.1	11.6
<i>C. mexicana</i>	13.9	5.9	3.6	<i>A. fragilisima</i>	24.8	7.1	9.2
<i>C. brachypus</i>	13.7	5.8	3.6	<i>S. vulgare</i>	16.6	16.6	6.2
<i>A. rigida</i>	7.7	3.5	2.0	<i>S. filipendula</i>	11.4	11.4	4.2
<i>A. fragilissima</i>	5.7	2.4	1.5	<i>A. anastomosans</i>	8.4	2.9	3.1
<i>D. delicatula</i>	5.2	1.3	1.4	<i>D. cervicornis</i>	6.4	1.5	2.4
				<i>J. adhaerens</i>	5.3	5.3	1.9
Botelho							
RAINY				DRY			
<i>S. vulgare</i>	59.9	21.9	48.8	<i>S. vulgare</i>	49.9	21.7	53.7
<i>S. schroederi</i>	50.8	14.0	41.4	<i>S. filipendula</i>	15.8	15.8	16.9
<i>P. tetrastomatica</i>	5.8	5.8	4.7	<i>D. cervicornis</i>	13.3	8.1	14.3
<i>S. furcatum</i>	2.4	2.4	1.9	<i>P. gymnospora</i>	7.7	5.9	8.2
				<i>S. zonale</i>	1.7	1.7	1.8
				<i>G. variabilis</i>	1.7	1.7	1.8
				<i>D. delicatula</i>	1.4	0.7	1.5
Humaitá							
RAINY				DRY			
<i>H. spinella</i>	19.5	3.0	61.7	<i>H. spinella</i>	9.4	4.5	36.9
<i>B. plumosa</i>	11.5	2.5	36.5	<i>S. schroederi</i>	5.2	4.6	20.6
<i>P. caeruleascens</i>	0.5	0.3	1.6	<i>B. plumosa</i>	3.2	2.1	12.5
				<i>D. cervicornis</i>	2.4	0.5	9.5
				<i>D. bartayresiana</i>	2.2	2.2	8.5
				<i>P. caeruleascens</i>	1.7	1.1	6.6
				<i>U. lactuca</i>	0.8	0.4	2.9
				<i>D. mertensii</i>	0.6	0.6	2.2



Table IV (cont.)

Taxon/ Season	g.m <sup>-2</sup>	S.E	Pi(%)	Taxon/ Season	g.m <sup>-2</sup>	S.E.	Pi(%)
Penha				DRY			
RAINY				DRY			
<i>B. seaforthii</i>	202.1	16.9	64.6	<i>D. delicatula</i>	122.6	32.1	29.1
<i>D. delicatula</i>	59.3	9.8	18.9	<i>B. seaforthii</i>	64.3	30.9	15.3
<i>L. variegata</i>	38.6	16.5	12.3	<i>D. justii</i>	53.1	27.3	12.6
<i>A. multifida</i>	5.0	4.9	1.5	<i>D. mertensii</i>	41.9	24.2	9.9
				<i>L. variegata</i>	26.1	15.2	6.2
				<i>D. marginata</i>	24.5	17.9	5.8
				<i>C. kempfi</i>	14.8	5.3	3.5
				<i>H. opuntia</i>	14.7	13.3	3.5
				<i>H. discoidea</i>	12.8	5.7	3.0
				<i>B. occidentalis</i>	10.6	9.8	2.5
				<i>P. undulatum.</i>	9.2	6.0	2.2
				<i>l. S. schroederi</i>	5.6	3.3	1.3
				<i>J. adhaerens</i>	5.5	3.4	1.3
				<i>G. acerosa</i>	5.5	5.1	1.3
				<i>U. cyathiformis</i>	4.4	4.1	1.0
Farol da Barra				DRY			
RAINY				DRY			
<i>D. delicatula</i>	80.0	12.5	66.4	<i>D. delicatula</i>	53.0	4.6	78.2
<i>G. pusillum</i>	23.3	5.3	19.4	<i>G. ligulata</i>	10.5	3.6	15.4
<i>G. ligulata</i>	13.4	8.3	11.1	<i>G. pusillum</i>	1.7	1.1	2.5
<i>l. J. adhaerens</i>	1.7	1.7	1.4	<i>S. schroederi</i>	1.2	0.9	1.8
				<i>A. multifida</i>	0.9	0.5	1.3
Saubara				DRY			
RAINY				DRY			
<i>S. cymosum</i>	153.1	19.1	40.3	<i>S. cymosum</i>	129.2	26.9	52.8
<i>G. acerosa</i>	13.8	13.8	3.6	<i>G. cervicornis</i>	80.3	28.1	32.8
<i>P. gymnospora</i>	10.5	4.6	2.5	<i>D. obtusata</i>	10.5	6.7	4.3
<i>G. cervicornis.</i>	5.0	2.7	1.1	<i>C. officinalis</i>	8.5	4.2	3.5
<i>D. delicatula</i>	3.8	1.8	1.0	<i>A. fragilissima</i>	5.0	3.9	2.1
				<i>J. adhaerens</i>	3.9	3.1	1.6
				<i>P. gymnospora</i>	3.6	3.4	1.5

The dendrogram built based on the similarity index accused the existence of four distinct clusters of sampled sites (Figure 4). Two clusters consist of a single sampled site each: cluster 1 represented by Saubara (56%) and cluster 2 represented by Humaitá (46%). Clusters 3 and 4 consist of two (Farol da Barra and Penha) and three sampled sites (Tapera, Paramana and Botelho), respectively. The SIMPER (Table VI, A and B) analyses revealed that clusters 1 and 2 differed mainly by the presence and relative abundances of *S. cymosum* (contributed with 90% for the formation of cluster 1) and *H. spinella* (contributed 72% for the formation of cluster 2). Cluster 3 is characterised by *D. delicatula* contributing with 81%, and cluster 4 is characterised by the contribution of *S. vulgare* of 62%.

## DISCUSSION

Thirteen of the 143 observed taxa were recently recorded for the first time in the area by other authors: five were found in the coast of Bahia State by Barros-Barreto *et al.* (2004), three were also found for the first time in the northeast region of Brazil by Barros-Barreto *et al.* (2004), and a total of five were found in the Brazilian coast by Villaça & Jensen, (2006), Barros-Barreto (2006), and Barros-Barreto *et al.* (2004).

The orders Bryopsidales, Dictyotales, and Ceramiales were the most abundant during this study. Yoneshigue *et al.* (2006) mentioned these orders as the main groups of macroalgae recorded by the REVIZEE Program for benthic diversity of

Table V. Indices of Diversity ( $H'$ ) and Evenness ( $J'$ ) found for both seasons for every sampled site.

SITE	SEASON					
	RAINY		DRY		MEAN VALUE	
	$H'$	$J'$	$H'$	$J'$	$H'$	$J'$
Tapera	1.50	0.47	1.61	0.45	1.56	0.46
Paramana	1.56	0.51	1.79	0.53	1.68	0.52
Botelho	1.10	0.33	1.41	0.44	1.26	0.39
Humaita	0.75	0.36	1.69	0.58	1.22	0.47
Penha	1.06	0.36	2.29	0.61	1.68	0.49
F. da Barra	1.00	0.39	0.75	0.31	0.87	0.35
Saubara	0.81	0.31	1.30	0.42	1.06	0.37

the Brazilian continental shelf. Villaça *et al.* (2006) found the same orders to be the dominant groups when studying the flora of the northeastern Brazilian coastal region of Fernando de Noronha, São Pedro and São Paulo island, the Archipelago of Abrolhos and in the Trindade and Martin Vaz complex of islands. The same authors found similar relative proportions of Ochrophyte and Rhodophyte in Atol das Rocas, but registered a higher proportion of Cladophorales order, instead of Bryopsidales, as found in our study.

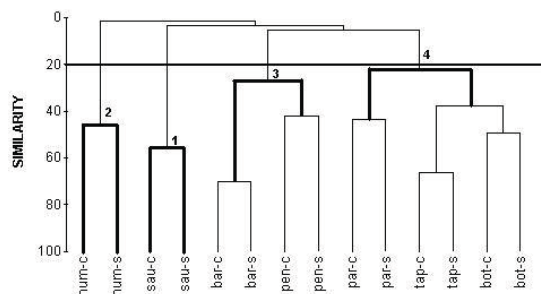


Figure 4. Cluster analysis of the relative dry biomass of each taxon in each sampled site and season, with Bray-Curtis distance. Four clusters are indicated with bold lines, with 30–56% of mean similarity.

The contrasting difference between the great number of taxa found in Penha and Itaparica Island and the low number of taxa found in Farol da Barra and Humaita that could be correlated with the seawater condition of these areas. Seawater in Farol da Barra and Humaita is much eutrophic (Macedo *et al.* 2001), while seawater in Penha is visibly much more clear and clean. We think this illustrates how the environmental conditions drive the distribution of marine flora in the TSB, accounting for the observed differences in number of species, composition and abundance of macroalgae observed between these sampled sites.

Similarly to what was found in previous studies in the northeastern Brazilian coast, Ochrophyta were the most abundant macroalgae in the TSB (Coutinho *et al.* 1993, Amado Filho *et al.* 1997a, Villaça & Pitombo 1997, Muñoz & Pereira 1998, Figueiredo 2000, Costa Jr. *et al.* 2002, Villaça 2002, Paula *et al.*, 2003, Villaça *et al.* 2006).

*Sargassum* spp. and *D. delicatula* contributed with about 12% for the similarity between the sampled sites and seasons. Both genera were described by Figueiredo (2000) as the most important brown algae in the area at depths of 5–10 m in the Archipelago of Abrolhos, while Villaça *et al.* (2006) reported having observed *Sargassum* spp. and Dictyotales partially covering the base of the coral reefs. *D. delicatula* was found in all sampled sites and seasons and contributed with 80% for the formation of cluster 3. This species is recorded for the Caribbean Region in many different habitats (Hay *et al.* 1988, Littler & Littler 2000), being usually found in association with *Sargassum* spp. in tropical waters (Hay *et al.* 1988, Figueiredo 2000).

Although *H. spinella*, *Amphiroa* spp., *D. delicatula* and *D. cervicornis* were observed in the TSB mainly as epiphytes, their abundance and distribution in the sampled sites reflect their importance to the TSB benthic communities. These taxa were also registered as epiphytes in seagrass beds in the archipelago of Abrolhos (Paula *et al.* 2003), and in the coral reefs of the coast of Salvador (Nunes 1997). These results highlight the ecological importance of these taxa for the structure of phytobenthic populations of the Brazilian northeastern region.

It should be highlighted that the genus *Halimeda* was found in great quantities in Paramana and Tapera. This is one of the most commonly found calcified

Table VI. Results from SIMPER analysis. A. Average similarities within the clusters indicated by the cluster analysis (cut off = 90%) and the % of contribution of each species contribution for the clusters formation. B. Average difference between the different clusters and % of each species contribution for the formation of the clusters.

A.						
CLUSTERS	1	2	3	4		
<b>AVERAGE SIMILARITY IN EACH CLUSTER (%)</b>	56.11	45.99	37.04	32.82		
<b>SPECIES</b>						
<i>Sargassum vulgare</i>						61.98
<i>Sargassum filipendula</i>						15.52
<i>Halimeda opuntia</i>						7.28
<i>Lobophora variegata</i>						6.66
<i>Dictyopteris delicatula</i>				80.50		
<i>Bryothamnion seaforthii</i>				7.88		
<i>Gelidiella ligulata</i>				5.00		
<i>Sargassum cymosum</i>	89.72					
<i>Amphiroa fragilissima</i>	3.48					
<i>Hypnea spinella</i>		71.82				
<i>Bryopsis plumosa</i>		24.32				

B.						
PAIRED ANALYSIS OF THE CLUSTERS	1x2	1x3	1x4	2x3	2x4	3x4
<b>AVERAGE DIFFERENCE BETWEEN THEM (%)</b>	99.80	98.21	95.71	99.20	97.93	94.33
<b>SPECIES</b>						
<i>Amphiroa fragilissima</i>	4.18	2.62	2.51			
<i>Bryopsis plumosa</i>				4.06	3.45	
<i>Bryothamnion seaforthii</i>		11.52		18.53		12.94
<i>Corallina officinalis</i>	7.15	4.85	5.53		3.75	2.53
<i>Dichotomaria obtusata</i>	3.33	2.26	2.24			
<i>Dictyopteris delicatula</i>		16.50		38.68		18.62
<i>Dictyopteris justii</i>		2.00		2.98		2.22
<i>Dictyota cervicornis</i>					2.84	1.74
<i>Dictyota mertensii</i>				2.59		1.87
<i>Gelidiella acerosa</i>	2.89	1.76	1.73			
<i>Gelidiella ligulata</i>		1.76		5.01		2.18
<i>Gelidium sp.</i>		1.74		4.41		2.11
<i>Gracilaria cervicornis</i>	13.22	8.90	8.78			
<i>Halimeda opuntia</i>			8.54		13.62	9.80
<i>Hypnea spinella</i>	5.18			8.03	6.71	
<i>Lobophora variegata</i>		2.74	7.72	4.31	13.66	10.10
<i>Padina gymnospora</i>	2.74	1.72	1.42			
<i>Sargassum cymosum</i>	51.58	32.94	32.38			
<i>Sargassum filipendula</i>			5.68		10.5	6.67
<i>Sargassum furcatum</i>					2.35	1.53
<i>Sargassum vulgare</i>			12.32		25.48	14.96
<i>Spatoglossum schroederi</i>			2.49	1.51	6.37	3.26

algae found in coral reefs of the Brazilian northeastern coast (Leão 1982, Carvalho 1983, Martins *et al.* 1991, Coutinho *et al.* 1993, Villaça & Pitombo 1997, Costa Jr. *et al.* 2002), besides being one of the most common taxa found in coral reefs (Lirman 2001) and one of the most important sources of carbonates to the reef systems (Adey 1998, Villaça 2002).

No significant variation in the diversity and evenness indices was detected between the different seasons, but the indices tended to be higher in the dry season. This is probably due to the more stable environmental conditions of this period, during which there is little variation in water salinity, sediments and sewage income (Wallner-Kersanach 1994).

In short, with the present study we have illustrated: 1) the rich marine flora of the TSB: 142 taxa 2) that these species are not uniformly distributed among the seven sampled sites; 2) that there was a trend towards higher diversity and evenness indices during the dry seasons; 3) that the local floristic composition was based on a benthic community structure chiefly composed by *Sargassum* spp., *D. delicatula*, and *Halimeda* spp; 4) that the environmental and seawater conditions were determinant for the composition and abundance of the flora in the TSB.

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